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AUTHOR	LaGrandeur, Kevin
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ABSTRACT

Computer mediated communication (CMC) tends to erase power structures because such communication somehow undermines or escapes discursive limits. Online discussions seem to promote rhetorical experimentation on the part of the participants. Finding a way to explain disparities between electronic discussion and oral discussion has proven difficult. Those in composition studies have tried to theorize CMC by reference to postmodern theory, but another form of theory that might help in the investigation of the nature of online communities derives from cybernetics and from information theory. Cybernetics' wider implications have led to the advent of a second-order cybernetics or systems theory--self-organizing, self-making, or autopoietic. Reflexivity provides an implicit reason for the difficulty of controlling electronic class discussion. Third wave cybernetics can be used in conjunction with social applications of systems theory to think about what happens when machines, teachers, and students are all "spliced" into one grand system. It seems that traditional approaches to class discussion with the instructor controlling the flow and order make it natural for teachers to view electronic communities as the early cyberneticists did, as allopoietic mechanisms whose goals can be set and observed. Though control of a system with multiple, dynamic elements may be somewhat difficult, a lack of control does not, in terms of systems theory, preclude an instructor's valuable involvement in an online community. (Includes 5 notes; contains 15 references.) (CR)

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Splicing Ourselves into the Machine: Electronic Communities, Systems Theory, and Composition Studies

by Kevin LaGrandeur
Department of English
Hofstra University

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In a recent article surveying research about computer mediated communication (CMC), Janet Eldred and Gail Hawisher point out that most critics–"postmodern" and "hard-line empiricists" alike– have come to the conclusion that CMC tends to "erase" power structures because it "somehow undermines or escapes discursive limits" (332). My personal experience over the last four years is certainly in agreement with the above claims. In that time, during which I have been teaching composition in a computerized classroom, I have found that CMC tends to diminish the power of the teacher to control discussions and to increase the power of the participants to do so. These changes in power can lead to behavior that many might consider problematic. I occasionally have noted in electronic discussion, as have others, a higher incidence of personal insults and off-topic discussion than in oral communication.[1] And because electronic discussion displaces the teacher from center stage, it can be difficult, once the conversation has started, to get the group to focus on a particular member's comment. On the other hand, those members of the class who

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are shy or who are traditionally marginalized tend to talk more. In my classes, for example, I have seen more participation by women and ethnic minorities in electronic discussions than in oral discussions. Additionally, online discussions seem to promote more rhetorical experimentation on the part of participants than do oral discussions: people feel more at ease about using personal anecdotes, using creative or unusual phrasing, and about taking risks with words.

Finding a way to explain these differences between oral and electronic intercourse has proven difficult. Indeed, it is the "somehow" in Eldred and Hawisher's statement above, the implicit puzzle concerning *how* electronic discussion alters discursive limits and changes the nature of the classroom community, that prompted me to write this paper. So far, composition theorists have mainly tried to explain computer mediated communication by reference to postmodern theory. Sirc and Reynolds, for instance, attempt to show how their students' apparent resistance to authority during electronic discussion is simply a *different form* of writing, a metacommentary about writing that is unfamiliar to most teachers, because it is enabled by the relatively new technology of virtual discussion. In their explanation, these researchers invoke Beaudrillard's notions of how we in the postmodern age struggle to impose order on new,

"unstable," or "insensate" forms (159); Lester Faigley discusses electronic exchanges in terms of "Bakhtin's principle of dialogism," where the "dialogic centrifugal forces of multiplicity, equality, and uncertainty" oppose the "centripetal forces of unity, authority, and truth" (308); and Gail Hawisher argues that that electronic conferences do not merely reflect, but are enabled by a movement in the field of composition toward social constructionism--"a view of meaning as negotiated, texts as socially constructed, and writing as knowledge creating" (83). Overall, such scholars as these see reflected--or enacted--in online discussion postmodern theory's questioning of traditional discourses and categories; its focus on meaning as negotiated, complex, and variegated; and its position that authority as constructed and questionable.

Though such resort to postmodern theory in order to ponder the dynamics of electronic discussion is reasonable, I would like to consider another form of theory that seems to have been overlooked so far, and that might help us in our investigation of the nature of online communities precisely *because* it began as a way to theorize our interaction with "smart" machines. The theory I refer to, systems theory, derives from cybernetics (the study of communication with and control of self-regulating mechanisms) and from information theory (the mathematical

model of communication developed by Claude Shannon to advance the study of cybernetics). Because many in the field of composition studies may not be familiar with systems theory, I will first outline some of its more important aspects and then turn, at the end of my paper, to its implications for online communities in the composition class.

Though it originally was conceived in the 1940's as a way to talk about how self-regulating machines such as missiles and computers operate, cybernetics was quickly seen to have much wider implications.[2] Indeed, the title of the first book on the subject, *Cybernetics: Control and Communication in the Animal and the Machine*, by Norbert Wiener, indicates as much. As the information theorist Alexander Weilenmann points out, this book, by its "reference to machine and animal, promises a general theory of matter and life, but applies in principle to any kind of system" (53). "We do not," Weilenmann continues, "regard cybernetics to be the theory of automata or of electronic networks or of computers or of any other particular mechanism. . . .Rather, we look at cybernetics as a science which cuts across and bridges various disciplines" (54). In fact, because of its general applicability, cybernetics , in combination with its cousin information theory, is now most often referred to as systems theory. This newer discipline

can be characterized most broadly as a collection of theories that address "purposive behavior involving feedback control" (62). Systems theory has been used to study interactions not only within and between inorganic systems, such as computers and missiles, but also within and between organic ones, such as cells and bodies. It was originally intended to explain the behavior of a complex system. However, as Katherine Hayles notes, "What complexity meant. . . was subject to changing interpretation," depending upon how one viewed the cycles of information and action that dictated the behavior of these systems. Specifically, questions cropped up about how widely feedback loops extended and who determined the definition of "purposive behavior" ("From Self-Organization. . ." 134).

What is particularly pertinent for those of us in the field of composition who study the dynamics of electronic discussion is the fact that who, or what, exercises "control" over a given system and its feedback mechanisms has been a main source of debate and change in the field of systems theory over the past fifty years. Through the 1950's, the field of cybernetics was mostly dominated by notions of homeostasis—that is, by a focus on how a disturbed system would, in the fashion of a thermostat, right itself. The organization and control of these simple kinds of systems were unproblematically defined in relation

to an outside observer. In other words, their goals were always set and their behavior observed by something external to themselves. For example, a human scientist would set the goal, for a thermostatic device, of maintaining a constant temperature in response to an environment and then evaluate the system's behavior from a supposedly "detached" standpoint. The problem with cybernetic theories concerning such externally-focused, or "allopoietic," systems was that they did not take into account how some systems—such as organic ones--might be able to define goals of their own; nor did they account for how the observer of a system might be implicated in its feedback mechanisms.

Such theoretical shortcomings led, around the early '60's, to the advent of a "second-order cybernetics," or second-order systems theory. In this new wave of theorizing, cybernetics and information theory were combined to center on the problem of reflexivity: how some systems, could use their own output as input and thereby operate independently. This phase was spurred by Heinz von Foerster's and Humberto Maturana's recognition, in the early 1960's, that cybernetics needed to take into account how organic systems, such as cells, operate. Such systems, they realized, could independently use feedback to adjust to their environment, could separate useful information from "noise," and could, if disrupted, return to a stable state

on their own. Thus they could be seen as self-organizing. Moreover, unlike missiles or robots, their primary goal was not to perform a task set for them by some external observer, but to perpetuate their own internal structure—which in itself was a collection of other organic systems. In this way, they could essentially be seen as self -making, or autopoietic, "composite unities." [3]

This "autopoietic turn" is significant not only because it indicates a more ambiguous relationship between a system and one who would control it, but also because a focus on reflexivity means that it is problematic to assume an observer who is neutral and outside the realm of the system. It was von Foerster who realized that the notion of the "circular causality" of feedback loops between the system and its environment implied that the observer of a system—the maker herself—must be seen as integrally connected to it. The very title of Von Foerster's book on the matter, *Observing Systems*, is a telling indication of the paradox that the observer is at once *apart from* and *a part of* the system. As Katherine Hayles notes, "the observer of systems can himself be constituted as a system to be observed" ("Boundary Disputes" 442). Hence, the observer must be taken into account in a comprehensive consideration of any system.

By this point, many might see where this explication is headed, but let me pause here to make explicit the parallels I see between systems theory and composition studies. As we have seen, second-order systems theory defines a system as any kind of goal-oriented, composite unity that operates in a self-regulating way by adjusting its output to changing input. Given such a definition, we may think of an English composition class as analogous to an organic system whose goal is to produce and explore the meaning of texts. In these terms, the oldest notions of conducting class are roughly analogous to first-order cyberneticists' attitudes towards their creations. The teacher, like the old cyberneticist, had a tightly-defined goal for any discussion. Like the trajectory of a missile, students' answers (output) to given questions (input) were expected to follow a very predictable pattern, based on the goals that the teacher had set by way of lecture. Any comments that the teacher did not see as immediately pertinent to the given question were considered "noise," a cybernetic term for that which is not information. They were impediments to achieving the goal of the already-determined answer. The considerations of reflexivity stipulated by second-order systems theory provide an interesting metaphor for the greater recognition given more recently to students' needs and ideas with respect to the production and interpretation

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of texts: students' texts have come to be considered important in themselves, and significant as part of a larger text-producing system in which notions of reader and author blur. The student-reader of a professional author's text is now validated as a young or an inexperienced author rather than as a mere reader, and his or her texts are also considered worthy material upon which to base a class. Indeed, more recent notions of class discussion have focused on it as an opportunity for its members to trade ideas; most teachers I know do not automatically quash the extraneous comment, but often see it as a chance for developing an interesting and new thread in the exchange. Reflexivity also provides an implicit reason for the difficulty of controlling electronic class discussion: systems which have a significant organic component tend to autopoietically gravitate toward their own agenda. In such a machine-human system as an electronic discussion, moreover, reflexivity dictates the teacher's irresistible complicity in it, and hence a lack of control over it. Yet such analogies can only remain limited metaphors, in terms of first or second-order systems theory. For even the latter theory still only deals with simple organic systems such as cells. A cybernetic theory that deals more explicitly with societies-as-systems is necessary before one can really use systems

theory to explore human-machine interfaces such as electronic discussions.

Certain sociologists such as Walter Buckley and Niklas Luhmann have, in fact, recognized that the complicity of observers in their systems and of the existence of self-organizing and self-making systems hold implications for the study of societies. Luhmann's work is more recent and more innovative than the rest, and best suits our discussion. He grounds his ideas in Phenomenology and in social constructivism (an echo of the postmodern theories that we in Composition have already used to describe electronic communities). He describes a society as a horizontal network of interconnected systems, each of which is a "network of …components that recursively, through their interactions, generate and realize the network that produces them" (xx). Thus, Luhmann appropriates Maturana's general notion of self-organizing, organic systems as composite unities. In terms of the study of online communities, the most significant modification that Luhmann brings to systems theory is that of defining the most basic element of social systems as *communications*, as bits of information that provide the links which form social groupings (xxiii). This focus on *links* renders the definition of "society" very flexible. It means that any society—whether consisting of humans, or of humans and machines—is essentially a composite

unity of evolving, self-generated communications, a web of evolving, self-regenerating "feedback loops."

The implications for electronic communities here are profound, especially when we consider Luhmann's theories about social systems in light of current thinking in general systems theory. This current theory is what Katherine Hayles calls the "third wave" that has arisen since 1980, along with the advent of virtual reality (463). In the virtual worlds created *of* electronic communications, such as email, newsgroups, and electronic discussions,

> the emphasis shifts to emergence and immersion. Whereas for Maturana self-organization was associated with homeostasis, in the simulated computer worlds of the third wave, self-organization is seen as the engine driving systems toward emergence [and differentiation]. Interest is focused not on how systems[--now combining human and machine into one reality—] maintain their organization intact, but rather on how they evolve in unpredictable and often highly complex ways. (463)

Third wave cybernetics, then, can be used in conjunction with social applications of systems theory to think about what happens when machines, teachers, and students are all "spliced" into one grand system. We in composition studies can examine what happens among students, teachers, and their machines in terms of what Katherine Hayles calls "emergent

processes that evolve spontaneously through feedback loops between human and machine" (467).

Because there is, in the "third wave" of cybernetics, "the idea of a virtual world of information that coexists with and interpenetrates the material world," one has the illusion of being disembodied (443). That is, "This construction of information allows cyberspace to be conceptualized as a disembodied realm of information that humans enter by leaving their bodies behind. In this realm…we are transformed into information ourselves and thus freed from the constraints of embodiment" (464). This may not only help us to think about "flaming" (online rudeness), but also about discursive coherence. This aspect of systems theory implies that there is something within the dynamic that impels us to find a task or a personality around which the group may "embody" itself, and that there is, perhaps, a threshold of time after which such coherence is impossible.

Indeed, timing seems essential. In any complex system, once initial conditions are set, the multiplicity of interactions that both result from those conditions *and* help to form new ones is very hard to control. This kind of behavior is common in all nonlinear systems, as the scientist Donald E. Herbert points out. In nonlinear dynamic systems, he notes, there are "qualitative changes . . . described as *bifurcations*" which result from variation

in "system parameters" (7). In complex systems—which may include such things as weather patterns, the flow of a waterfall, or, I would say, an online discourse community—the parameters that tend to be especially important are those which arise from *initial conditions*. Thus, in an online discussion, where the web of communications that constitute and sustain the society are hard to control, the shape an initial prompt takes will increase or decrease bifurcations. In practical terms, this helps explain certain research results, such as those cited by Eldred and Hawisher: "what seem[s] to determine the direction of C[omputer] M[ediated] C[ommunication] [is] the idea or position first advanced" (339).

It also might explain why off-topic conversations and rudeness are so common: if the initial prompt in an electronic conversation does not provide the gravity to bind the constellation of communications that constitute the online community, to keep those communications simple enough relative to the needs of the class at the given moment, then that community may simply become a sea of "noise," and dissipate. As Luhmann points out, there is a need for "systems to maintain an asymmetrical, 'simplifying' relationship to their environment" if they are to survive (xvii). Systems that become too complex, that have too many bifurcations, fall apart. The "psychic system. . .that

becomes too complex," for example, "runs the risk of turning 'pathological' in the sense that it will be unable to make decisions, perform simple tasks, or function in society" (xvii-xviii). Similarly, the online "society" that forms in a "classroom" environment, if it spins out too many random threads, risks becoming "aimless" and grinding to a complete halt.

Yet if too many threads in the communications that comprise the electronic community can cause its degeneration, a certain amount of such nonlinear complexity is exactly what seems to be at the root of the mysterious, positive aspects of electronic discussion that I mentioned at the beginning of this essay. That is, the nonlinear dynamics of a virtually-constituted community may help explain how CMC "escapes discursive limits" and "erases power structures," as Eldred and Hawisher put it. It seems that traditional approaches to class discussion--with the instructor controlling the flow, order, and length of comments to a question that she poses, and with the instructor also (usually) taking center stage by her active moderation of the interchange--make it natural for us to view electronic communities as the early cyberneticists would have viewed one of their systems: as allopoietic mechanisms whose goals we can set and observe. However, as anyone who has experienced the difficulties of controlling

the form and direction of electronic discussions knows, online groups are like the autopoietic systems of the third wave: their chief goal changes in definition as the web of communications that constitutes these groups grows and changes. One might say that such phenomena are part of the nature of complex, emergent systems that "evolve spontaneously through feedback loops between human and machine."

Indeed, the way that the computer program operates during an electronic discussion makes it an integral part of the social system it mediates. In sorting and presenting what discussants write, the computer does not filter comments, as a teacher would, by choosing one student at a time to talk. The machine simply orders comments according to when they were sent, and since they tend to be sent in clusters, there are time distortions that disrupt any sense of the comments' linear flow. All of these sorting and transmission eccentricities are important because, taken together, they signify that the computer is rearranging discursive flow: it is replacing the linear, temporally-related set of interactions characteristic of an oral class-discussion with a non-linear, topically-related one. That is, students are not commenting one at a time about the most recent remark another student made, but instead are commenting in clusters about the remark whose topic most

strongly caught their attention—whether or not it was the most recently-made. Moreover, this imposition by the computer of a series of constantly splitting, non-linear exchanges means that the teacher is being displaced from her powerful role as the arbiter of communications. And, as communications *form* the online society, this also means that the computer is displacing her as the nexus of that society, as the star around which its communications swirl. With the computer replacing the teacher and the classroom as the focus and the *locus*, respectively, of community, we have a natural dissemination of authority and what systems theory would describe as an instance of an emergent system that may "evolve in unpredictable and often highly complex ways."

Though control of a system with multiple, dynamic elements may be somewhat difficult, a lack of control does not, in terms of systems theory, preclude an instructor's valuable involvement in an online community. The teacher, as well as the participants and the computer, all help form the "webbed stream" of the discussion, whose communications, in turn, create the online society.[4] All are involved in the intersecting feedback loops that enable the system and are part of how it must be conceived. Thus the most recent instantiation of systems theory provides insight as to why the teacher becomes integral to an electronic discussion, and why she is at the same time marginalized from it. I

grant that this insight may provide small comfort to those who feel the need to maintain a tight rein on the activity in their classes, but if our goal in the classroom discussion is to promote creative, independent thinking, systems theory promises at least two ways of realizing concrete results, despite the apparent chaos of electronic discussion.

First, it is helpful, as a precondition, to think of such an environment as complex rather than chaotic (systems theorists have already made this move). Given this conception, the first helpful dictum that systems theory provides us is one I have already discussed—complex systems are highly sensitive to initial conditions; the second is that such systems tend to be shot through with recurrent, though perhaps subtle, patterns. These stipulations should mean that if one is very attentive to how she constructs the initial prompt in an electronic discussion, and if she is able to exploit recursiveness as a teaching tool--by drawing students' attention to repeating motifs in a discussion, for instance, or by unfolding in various ways the transcript of a discussion--she will be able to make use of even an apparently chaotic experience. Indeed, I have found, in my four years of using electronic discussion, that these two practices are useful.

But to discuss in depth such practical applications of systems theory is beyond the scope of this paper, especially since I have barely begun to sketch the uses of this theory for exploring the dynamics of the virtual classroom.[5] My aim here has been to make beginnings, to open avenues that I and others can, hopefully, follow in order to better understand what makes electronic communities behave as they do. In a world where we increasingly think of ourselves and our communities in terms of information that cascades across our video screens, that understanding may be more crucial than we think.

Notes

[1] See, for instance, the essays by Kremers, George, and Takayoshi, respectively.

[2] This word derives from the Greek word for "governor" or "steersman."

[3] Rpt. in Katherine Hayles, "Boundary Disputes." As she explains, for Maturana, a self-organizing system "is a unity because it has a coherent organization, and it is a composite because it consists of components whose relations with each other and with other systems constitute the organization that defines the system as such" (462).

[4] I say webbed-stream because, though such discussions move, on the whole, in a linear fashion through time, the pieces of discussion that make it up relate to each other in a more web-like fashion. The computer itself is the central reason for this because of the way it affects the organization of the discussion: while one person writes a response to another's comment, the computer keeps posting other comments. Thus, the computer creates an environment where discussants do not have to take turns--and so it also gives rise to the distinct, multiple-threaded discussions typical of this medium and, in part, to the complexity of the community the communications create.

[5] I have discussed some points of these practices in an article in *Computers and Texts*, and plan to deal with them in more depth in a future essay.

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